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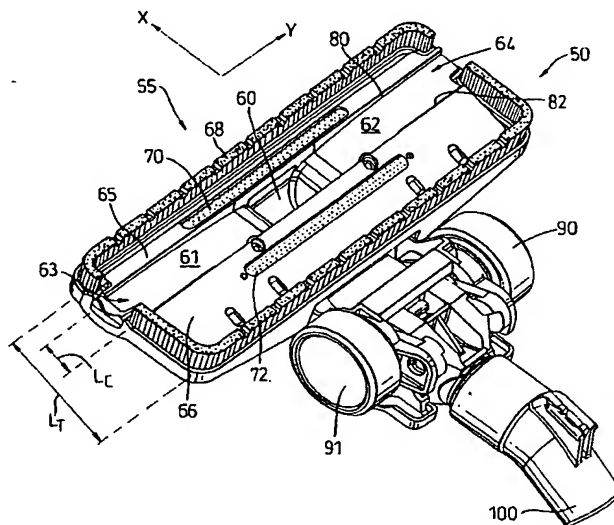
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[Continued on next page]

(54) Title: A FLOOR TOOL



(57) Abstract: A floor tool (50) for use in vacuum cleaning floor surfaces comprises a sole plate (55) having a suction channel (61, 62). The suction channel is bounded on at least one side by a working edge (80, 82) for engaging with the floor surface. Lint pickers (70, 72) are positioned alongside the suction channel (61, 62) and are separated from the suction channel (61, 62) by the working edge (80, 82). The lint pickers are mounted on a surface (65, 66) of the floor tool which is inclined with respect to the plane in which the working edges (80, 82) lie. The sole plate (55) is pivotally mounted with respect to a suction outlet such that movement of the floor tool (50) in a forward and backwards direction alternately brings one of the working edges (80, 82) in closer contact with the floor surface.

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— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT,

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

### A Floor Tool

This invention relates to a floor tool for use with a vacuum cleaner.

- 5 Cylinder or canister vacuum cleaners, as shown in Figure 1, generally comprise a main body 10 which contains separating apparatus 11 such as a cyclonic separator or a bag for separating dirt and dust from an incoming dirty airflow. The dirty airflow is introduced to the main body 10 via a hose 15 and wand 16 assembly which is connected to the main body 10. The main body 10 of the cleaner is dragged along by the hose as a user moves around a room. A cleaning tool 20 is attached to the remote end 17 of the  
10 hose and wand assembly. A range of cleaning tools are usually supplied so that a user can choose an appropriate tool for their cleaning task, such as crevice tool and a brush tool. The cleaning tool which is used for general cleaning is a floor tool 20. Figure 2 shows the underside of a floor tool sold by DYSON™ and shown more fully in  
15 Registered Design GB 2,074,319. The floor tool 20 is a wide tool with a sole plate on its lower side that glides over the floor surface. The sole plate has a suction inlet 21 and a suction channel 22-25 communicating with the inlet 21. The tool 20 is pushed backwards and forwards across a floor surface by a user. Air is drawn into the inlet 21 via the suction channels 22-25. Air reaches the channels 22-25 via inlets at the edges of  
20 the tool and via leakage between the sole plate of the tool and the floor surface. As the floor tool 20 passes over the floor surface, dirt, dust and other debris is carried along the suction channels 22-25 to the suction inlet 21 and along the hose and wand 15, 16 to the separator 11 in the main body 10 of the vacuum cleaner.
- 25 While floor tools of the kind shown in Figure 1 work well on hard floor surfaces, they are less effective on carpeted floors where hair, fluff and other fibrous material, collectively called 'lint', become trapped on the carpet. Thus, efforts have been made to improve the pick up performance of floor tools on carpeted floors. Some tools have a brush mounted in the suction inlet which is rotated so as to agitate the floor surface in  
30 the same manner as the brush bar of an upright vacuum cleaner. The brush can be rotated by the use of an air turbine or by an electric motor which is powered by a power

supply derived from the main body of the cleaner. However, this type of tool is more expensive than the passive floor tool.

Efforts have also been made to improve floor tools in a more passive manner. Floor tools usually have one or more lint pickers 30, 35 mounted on the sole plate. A lint picker is a strip of material into which a plurality of tufts of fine hair are secured. All of the tufts are aligned in the same direction with respect to the sole plate. The lint picker acts as a one-way gate, allowing lint to pass under the lint picker when the floor tool is pushed along the floor, but to block the lint when the floor tool is pulled backwards. The repeated forward and backwards action of the floor tool across the floor surface traps the lint and rolls it into a ball such that it can be sucked by the floor tool. Each lint picker is mounted within a recessed portion of the sole plate. However, the pick-up performance of such tools is limited.

The present invention seeks to improve the pick-up performance of a passive floor tool.

An aspect of the present invention provides a floor tool for use in vacuum cleaning floor surfaces comprising a sole plate comprising a suction channel, the channel being bounded on at least one side by a working edge which is suitable for engaging with and agitating a floor surface and a lint picker which is positioned alongside the suction channel and is separated from the suction channel by the working edge.

It has been found unnecessary to recess the lint picker and to break the working edge in order to accommodate the lint picker. Positioning the lint picker such that it is separated from the suction channel by the working edge provides a full effective working edge which maximises agitation to the floor surface. The lint picker is also able to operate on the floor surface.

Preferably the lower face of the floor tool adjacent to the working edge and on the side of the working edge remote from the suction channel is inclined with respect to the

plane in which the working edges lie. This supports the lint pickers such that they are close enough to the floor surface to provide a useful action.

5 Preferably, agitation is further improved by providing a working edge with a sharply defined, angular, edge with a minimal radius of curvature. An edge having a radius of around 0.2mm has been found to be effective.

10 The pick up performance of the tool is further improved by pivotably supporting the floor tool such that the working edges on each side of the suction channel are alternately brought into contact with the floor surface as the floor tool is pushed and pulled across the surface. As one of the working edges is brought into contact with the floor surface, the other raises slightly to allow air to bleed into the suction channel. This improves the agitating effect on the floor surface and reduces the motion resistance or push-force required to move the floor tool.

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Embodiments of the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows a known cylinder type of vacuum cleaner;

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Figure 2 shows a known type of floor tool for use with the cleaner of Figure 1;

Figure 3 shows a floor tool in accordance with an embodiment of the invention;

25 Figures 4 is a cross-section through the sole plate of the floor tool of Figure 3;

Figure 5 shows an isometric view of the floor tool in accordance with an embodiment of the invention;

30 Figure 6 is a side view of the floor tool of Figure 5;

Figure 7 is a cross-section through the floor tool;

Figure 8 is a simplified cross-section of the floor tool, and

- 5    Figures 9 and 10 show the sole plate of the floor tool in use as the tool is moved forwardly and backwardly across a floor surface.

As shown in Figures 3 and 4, the floor tool 50 comprises a housing having a lower plate 55, or sole plate, which is intended to ride along a floor surface. The sole plate 55 is fully shown in Figure 3. For ease of understanding in the following description, the arrowed line X in Figure 3 indicates the longitudinal direction and the arrowed line Y the transverse direction. The sole plate 55 has a centrally mounted air inlet 60 which communicates via a conduit to the outlet 100. Outlet 100 is suitably dimensioned to connect to a hose or wand of a vacuum cleaner as shown in Figure 1. Two suction channels 61, 62 extend transversely across the tool each side of the inlet 60. Each channel decreases in depth towards the sides of the tool and terminates in an inlet 63, 64 on the side of the tool. The length of channel 61, 62 ( $L_C$ ) is shown here as being about one third of the total length ( $L_T$ ) of the tool but this proportion can be varied. The side walls 75, 76 of the channels 61, 62 are sharply angled with respect to the inner face 77 of the channels. Forwardly and rearwardly of the suction channel 61, 62, the sole plate is formed as two planar surfaces 65, 66 which are inclined with respect to a plane W in which the working edges 80, 82 both lie. The intersection between the planar surface 65 and side wall 75 of the channel is a forward working edge 80 and the intersection between the planar surface 66 and side wall 76 of the channel is a rearward working edge 82. The working edges are sharply defined, as shown in Figure 4, so as to provide an effective agitating action when the floor tool is used on carpeted surfaces. A radius of curvature of 0.15mm on the working edges 80, 82 has been found to be effective although it will be apparent that a range of other values could also provide a similarly effective agitating action. The working edges 80, 82 extend across the full width of the floor tool. Lint pickers 70, 72 are positioned on the planar surfaces 65, 66 and are spaced from the working edges 80, 82 so that the working edges can perform an

agitating action on carpeted surfaces across their full width. Each of the lint pickers 70, 72 is of a conventional type, comprising a strip of material in which a plurality of tufts of fine fibre are secured. Each lint picker 70, 72 is secured on an arcuately-shaped support that extends outwardly from the planar surface 65, 66 on which it is located, as shown in Figure 4. The spacing of the lint pickers 70, 72 from the adjacent working edge 80, 82 can be varied from the spacing as shown in the drawings. For example, lint picker 72 could be positioned nearer to working edge 82. The lint pickers in Figure 3 are approximately one third to one half of the total width of the tool 50. The use of lint pickers causes an increase in the force that a user requires to push or pull the floor tool across a floor surface. It would be possible to increase the width of the lint pickers 70, 72 to substantially equal to the total width of the floor tool although this would incur an increase in the push force required by a user.

Figure 8 is a simplified cross-section of the floor tool, showing the main parts of the tool. Sole plate 55 is pivotally connected at 105 to a support member 120. The support member 120 supports wheels or rollers 90, 91 for rolling along the floor surface and also has as a suction conduit for guiding air from the sole plate 55. The support member 120 is pivotally connected at its rearmost end to the outlet pipe 100. Figure 8 shows the pivotal connection between the sole plate 55 and support member 120 as being directly above the centre of the suction channel 60, 61, 62. This is the ideal position of the pivotal connection. The embodiment shown in Figures 5-7 has the pivotal connection 105 above the suction channel 60, 61, 62 but offset from the dead centre of the suction channel.

The sole plate 55 pivotally connects to the support member 120. The connection between the sole plate 55 and support member 120 allows a limited degree of movement between these parts while maintaining a good seal between the parts. Movement of the sole plate 55 is restricted by projections 123, 124 (Figure 7) and 125 (Figure 5) on the support member 120. Anti-clockwise (rearward) movement of the sole plate is restricted by the projections 123, 124 which engage with the upper surface of the sole plate. Clockwise (forward) movement of the sole plate 55 is restricted by surface 125 of

the support member 120 which extends radially outwardly from the pivot point 105 between arms 121, 122. A corresponding radially extending surface 126 on the sole plate 55 lies flat against surface 125 when the extent of forward movement has been reached.

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As shown in Figure 7, the outlet 100 comprises a first part 101 and a second part 102. The first part 101 is pivotally mounted to the support member 120 about an axis passing through the centres of the wheels 90, 91. The second part 102 is an angled pipe which is rotatably connected to the distal end of the first part 101 about the longitudinal axis 101a of the part 101 so as to allow rotation of the angled pipe 102. Such an arrangement allows a good level of manoeuvrability of the floor tool when in use and is commonly employed in known floor tools. The angled pipe portion 102 is shaped and dimensioned so as to be connectable to the wand 16 of a domestic vacuum cleaner, as shown in Figure 1. In use, air is drawn through the tool in the directions of the arrowed lines.

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Figures 9 & 10 show how the floor tool 50 operates in use. Firstly, Figure 9 shows the floor tool 50 as it is pushed forwardly across a floor surface. As the tool is pushed forwardly, the sole plate 55 rotates about pivot 105 (Figure 7), bringing the forward working edge 80 into closer contact with the floor surface 150 than the rear working edge 82. The sharp edge 80 has an effective agitating effect on the surface, parting the pile of the surface and releasing dirt in a flicking action. As dirt is released, it is swept along the suction channel 61, 62 by the airflow in the suction channel towards suction inlet 60. Also, forward lint picker 70 is brought into contact with the floor surface. In its lowered position, the forward lint picker 70 allows lint to pass. The rear lint picker 72 remains close enough to the surface to serve a useful blocking action on lint.

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Figure 10 shows the floor tool 50 as it is pushed rearwardly across a floor surface. As the tool is pushed rearwardly, the sole plate 55 rotates about pivot 105, bringing the rear working edge 82 into closer contact with the floor surface 150 than the forward working edge 80. The sharp edge 82 has the same effect as forward edge 80 did during the

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forward action, i.e. it agitates the surface, parting the pile of the surface and releasing dirt in a flicking action. Dirt is swept along the suction channel 61, 62 by the airflow in the suction channel towards suction inlet 60. Rear lint picker 72 is brought into contact with the floor surface 150 and allows lint to pass. The forward lint picker, while raised  
5 higher than it would be during the forward action, remains close enough to the surface 150 to block the passage of lint. It can be seen that once the floor tool has passed over lint, the lint becomes trapped between the lint pickers and is prised from the surface.

In a conventional manner, the floor tool 50 also comprises a skirt 68 of flexible bristles  
10 which surrounds, but is not part of, the sole plate 55. The skirt 68 is movable between a deployed position, for use with cleaning hard floors, in which the skirt rides along the hard floor surface and serves to space the sole plate 55 from the floor surface, and a retracted position, for use when cleaning carpets, where the sole plate 55 is able to  
15 contact the floor surface and the skirt 68 is retracted sufficiently not to impede movement of the floor tool across the carpeted surface.

**Claims**

1. A floor tool for use in vacuum cleaning floor surfaces comprising a sole plate comprising a suction channel, the channel being bounded on at least one side by a working edge which is suitable for engaging with and agitating a floor surface and a lint picker which is positioned alongside the suction channel and is separated from the suction channel by the working edge.
2. A floor tool according to claim 1 wherein the suction channel extends across the tool transversely to the direction in which the tool is pushed across the floor surface.
3. A floor tool according to claim 1 or 2 wherein both sides of the suction channel are bounded by a working edge.
4. A floor tool according to any one of the preceding claims wherein the lower face of the floor tool adjacent to the working edge and on the side of the working edge remote from the suction channel is inclined with respect to the plane in which the working edges lie.
5. A floor tool according to claim 4 wherein the lint picker is mounted on a support which projects outwardly from the inclined lower face.
6. A floor tool according to claim 5 wherein the support is arcuately shaped.
7. A floor tool according to any one of claims 3 to 6 wherein the sole plate is pivotally mounted with respect to a suction outlet such that movement of the floor tool in a forward and backwards direction alternately brings one of the working edges in closer contact with the floor surface.
8. A floor tool according to any one of the preceding claims wherein the working edge is an angular edge.

9. A floor tool according to claim 8 wherein the working edge has a radius of curvature substantially equal to 0.2mm.

5 10. A floor tool according to any one of the preceding claims wherein the lint picker extends across more than one third of the width of the suction channel.

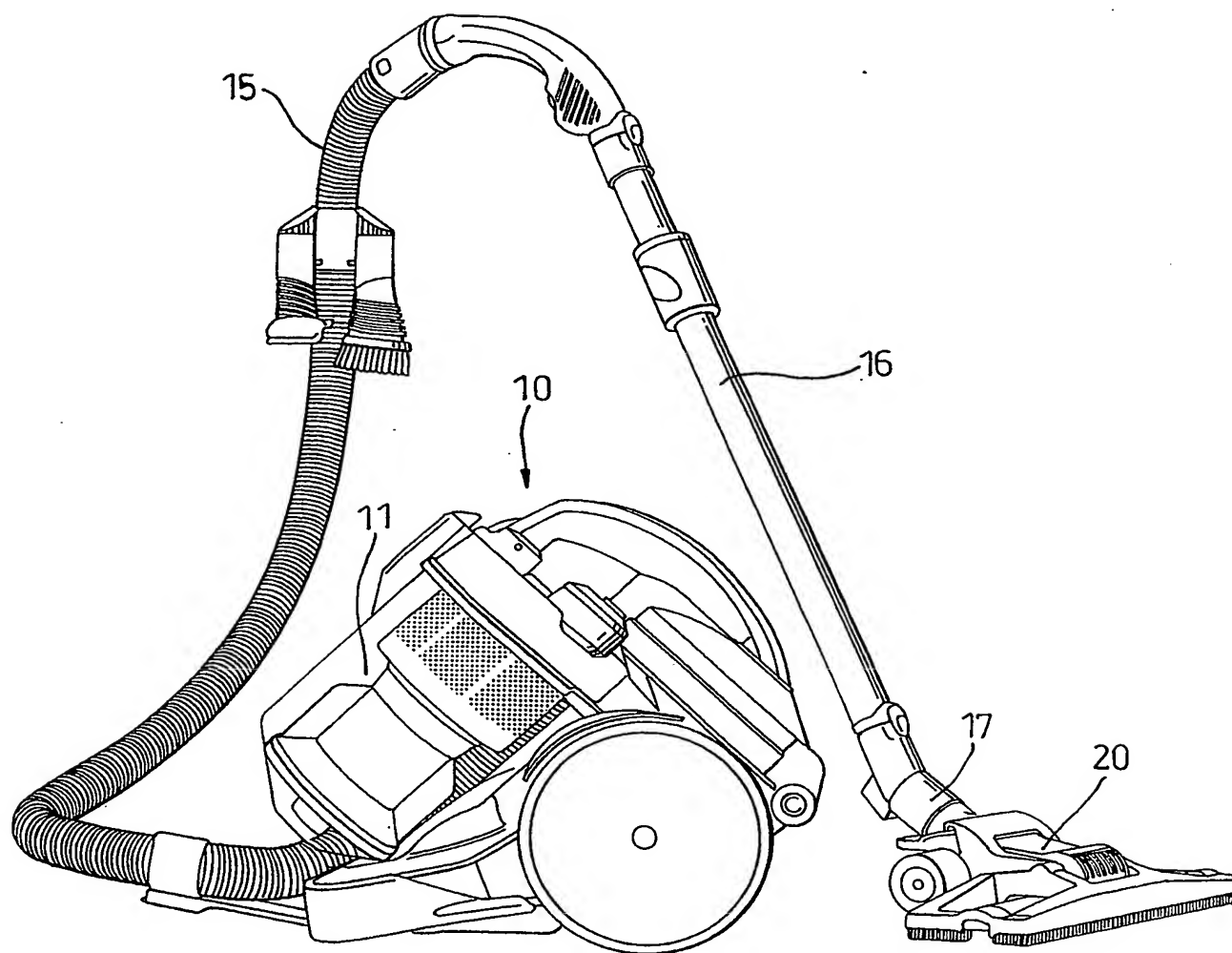
11. A floor tool according to claim 9 wherein the lint picker extends across substantially one half of the width of the suction channel.

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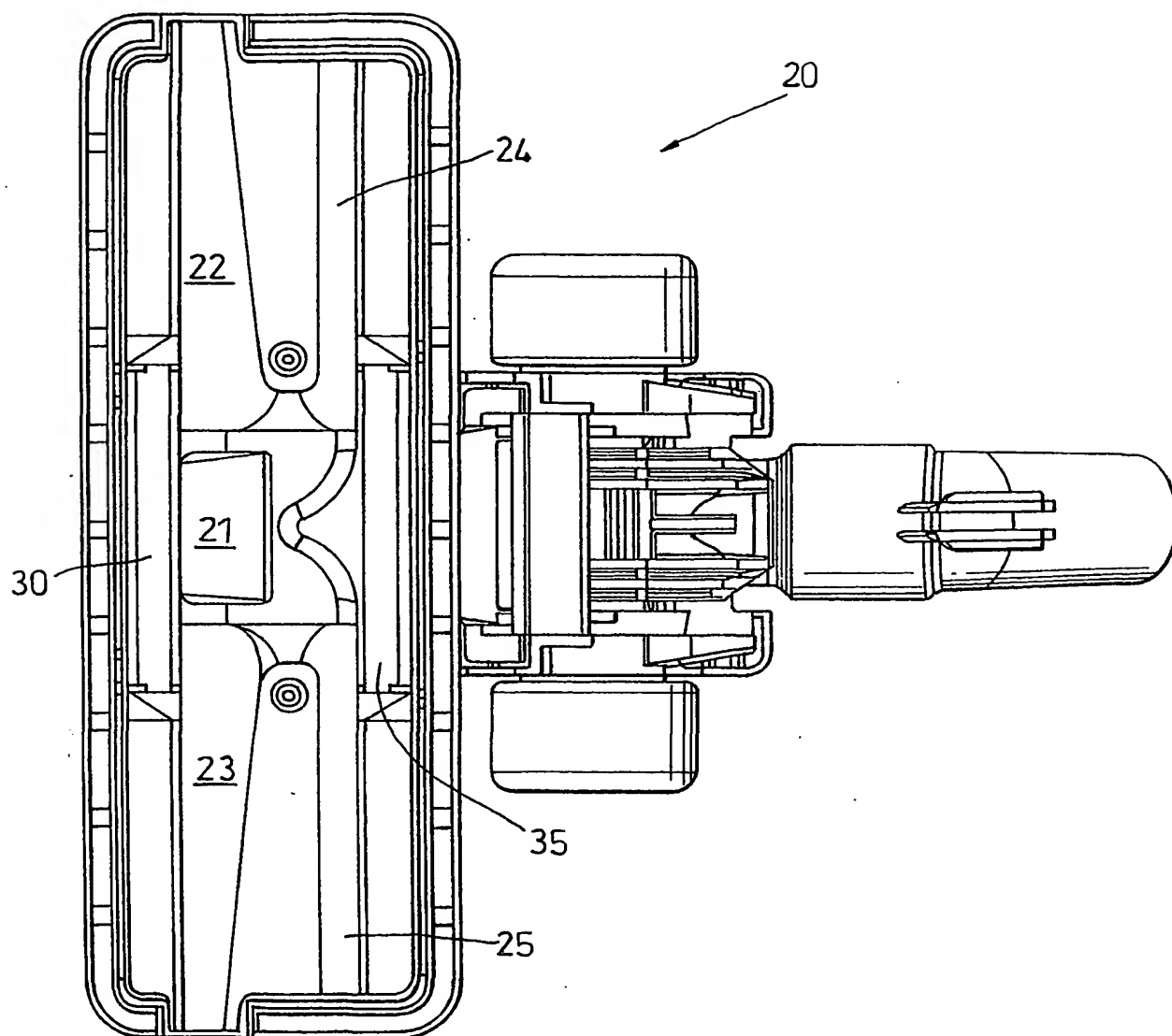
12. A floor tool according to claim 10 wherein the lint picker extends across substantially the full width of the suction channel.

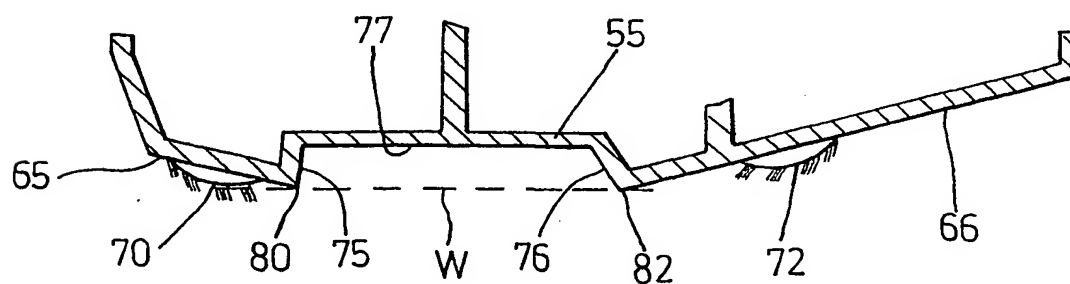
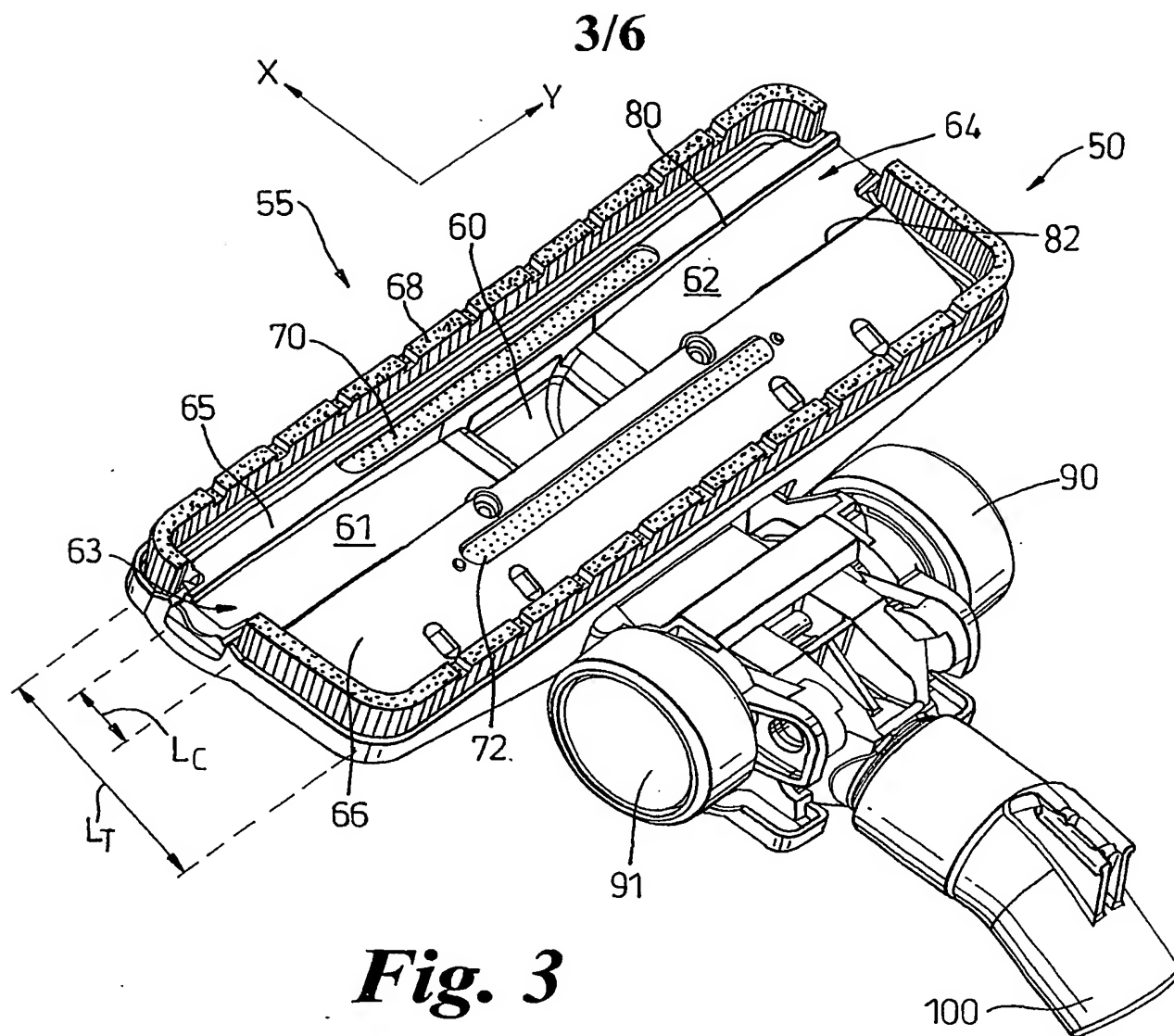
13. A floor tool substantially as described herein with reference to the  
15 accompanying drawings.

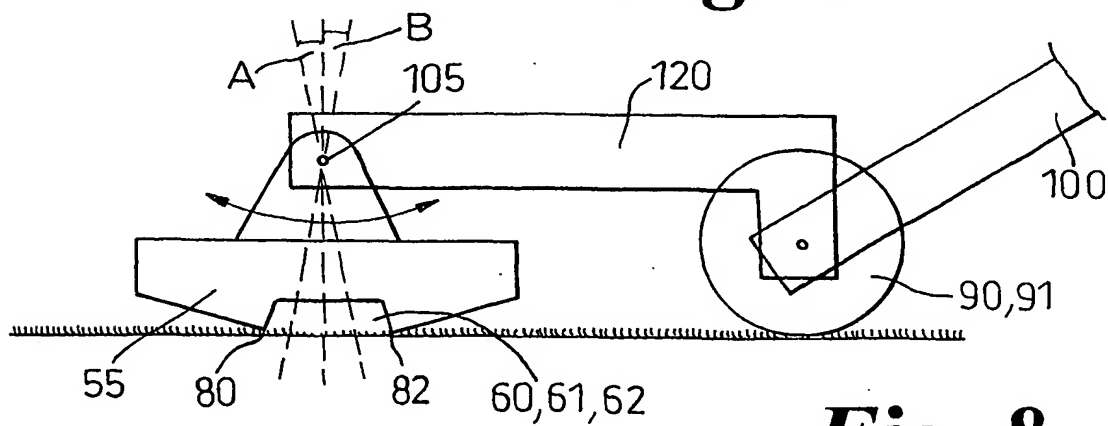
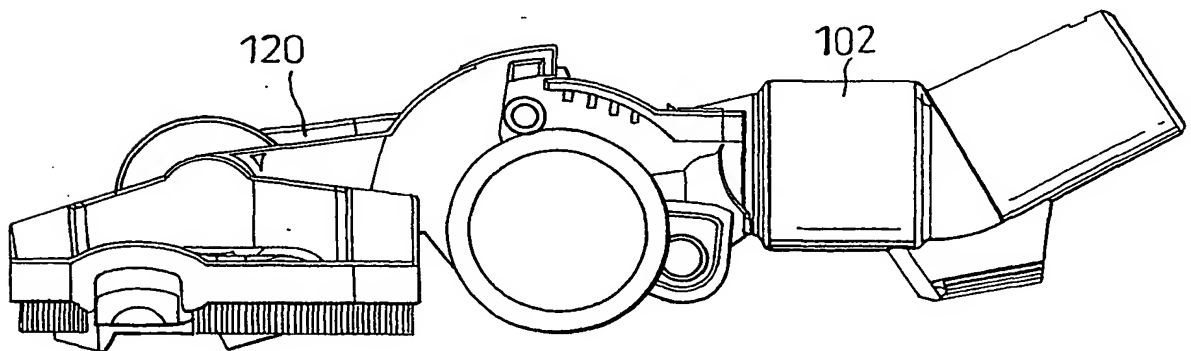
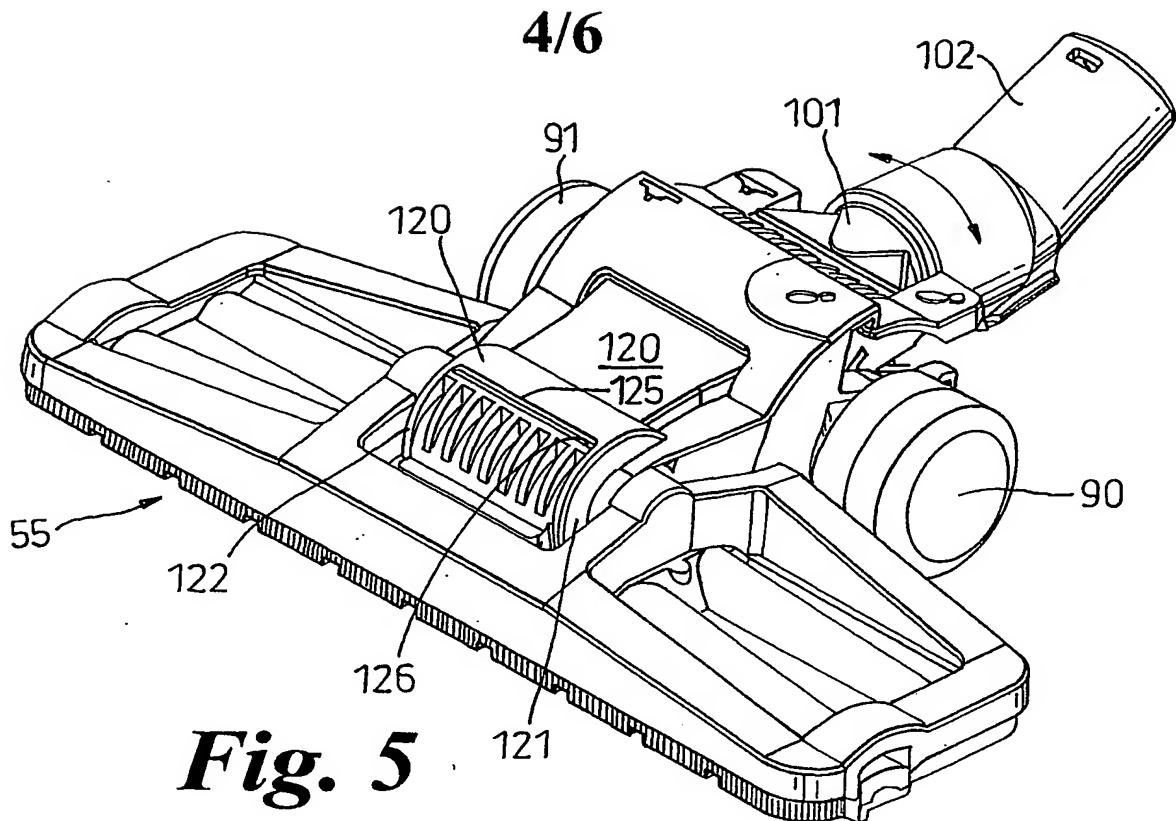
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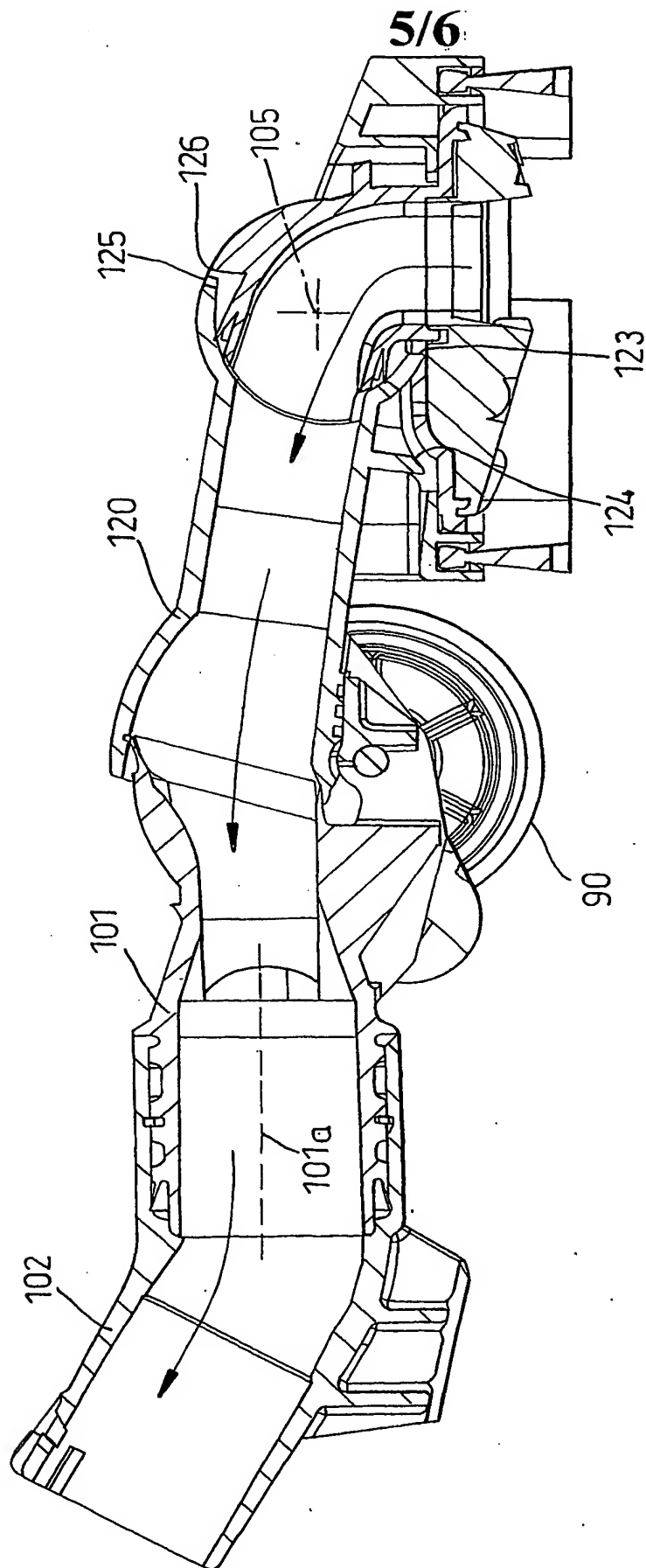
***Fig. 1***

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**Fig. 2**



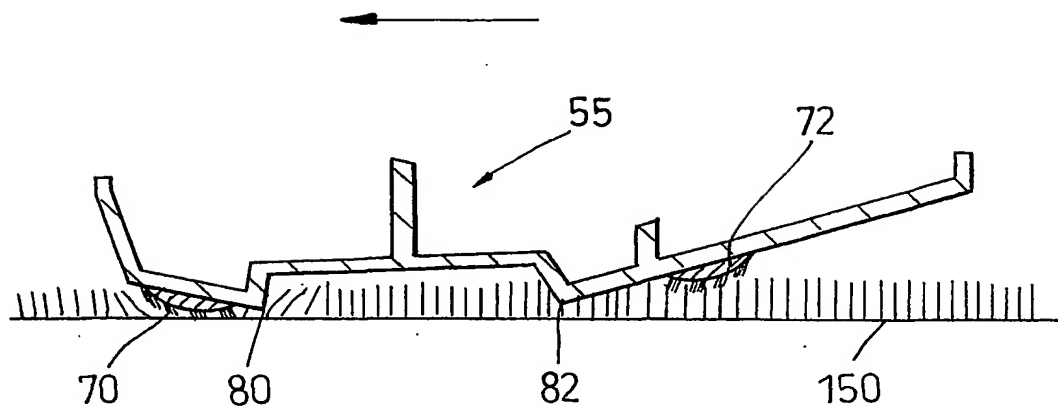
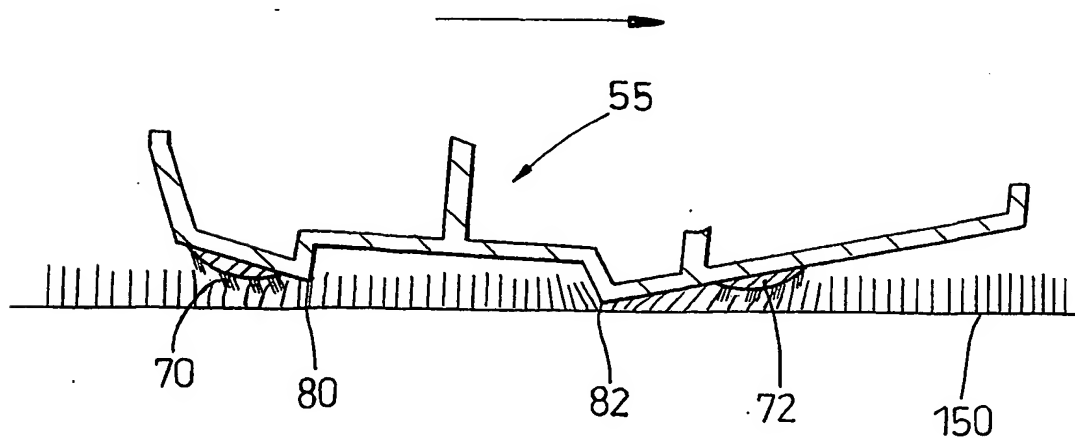




**Fig. 7**



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***Fig. 9******Fig. 10***

## INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/GB 01/04147

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A47L9/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 353 546 A (SIEMENS AG) 7 February 1990 (1990-02-07) column 3, line 22 -column 4, line 19; figure 1	1-4, 7-11, 13
X	EP 0 023 301 A (SIEMENS AG) 4 February 1981 (1981-02-04)  page 2, line 11 -page 3, line 4; figures 1-4	1-6, 8-10, 12, 13
X	DE 30 09 648 A (WESSEL HANS) 17 September 1981 (1981-09-17)  page 3, line 1 -page 4, line 5	1-3, 5, 7-10, 12, 13
A	DE 72 37 505 U ((WESSEL HANS)) 21 March 1974 (1974-03-21)	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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